

1 stepped pressure equilibrium code : pc01aa

Contents

1	stepped pressure equilibrium code : pc01aa	1
1.1	outline	1
1.1.1	nonlinear conjugate gradient method	1
1.1.2	implementation details	1

1.1 outline

1. Use accelerated steepest descent algorithm to find minimum of energy functional.

1.1.1 nonlinear conjugate gradient method

2. The basic algorithm, as described by [1], is

$$\mathbf{v}_{n+1} = \mathbf{v}_n(1 - b) + \Delta t \mathbf{F}(\mathbf{x}_n), \quad (1)$$

$$\mathbf{x}_{n+1} = \mathbf{x}_n + \Delta t \mathbf{v}_{n+1}, \quad (2)$$

where \mathbf{v} is the “velocity” vector, Δt is a “time step” parameter, and b is a small “viscous-damping” parameter, chosen

$$1 - b \approx \frac{F_n^2}{F_{n-1}^2}. \quad (3)$$

1.1.2 implementation details

3. The viscous-damping parameter is initialized $b = 0$.
4. The time-step is given on input, $\Delta t \equiv \text{maxstep}$.
5. The maximum iterations is given by the input variable `maxiter`. Termination is controlled by `pc00ab`.

pc01aa.h last modified on 2012-12-18 ;

[1] S. P. Hirshman and J. Breslau. Explicit spectrally optimized fourier series for nested magnetic surfaces. *Phys. Plasmas*, 5(7), 1998.